IWS3E Advanced Programs Technology Insertion

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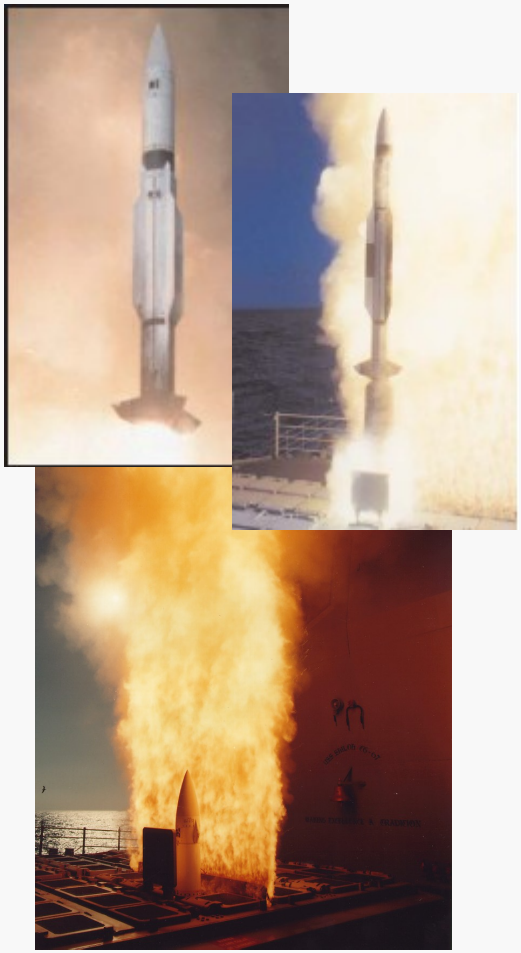
PEO-IWS 3E

NDIA Guns & Ammunition / Missiles & Rockets Conference

14 April 2004

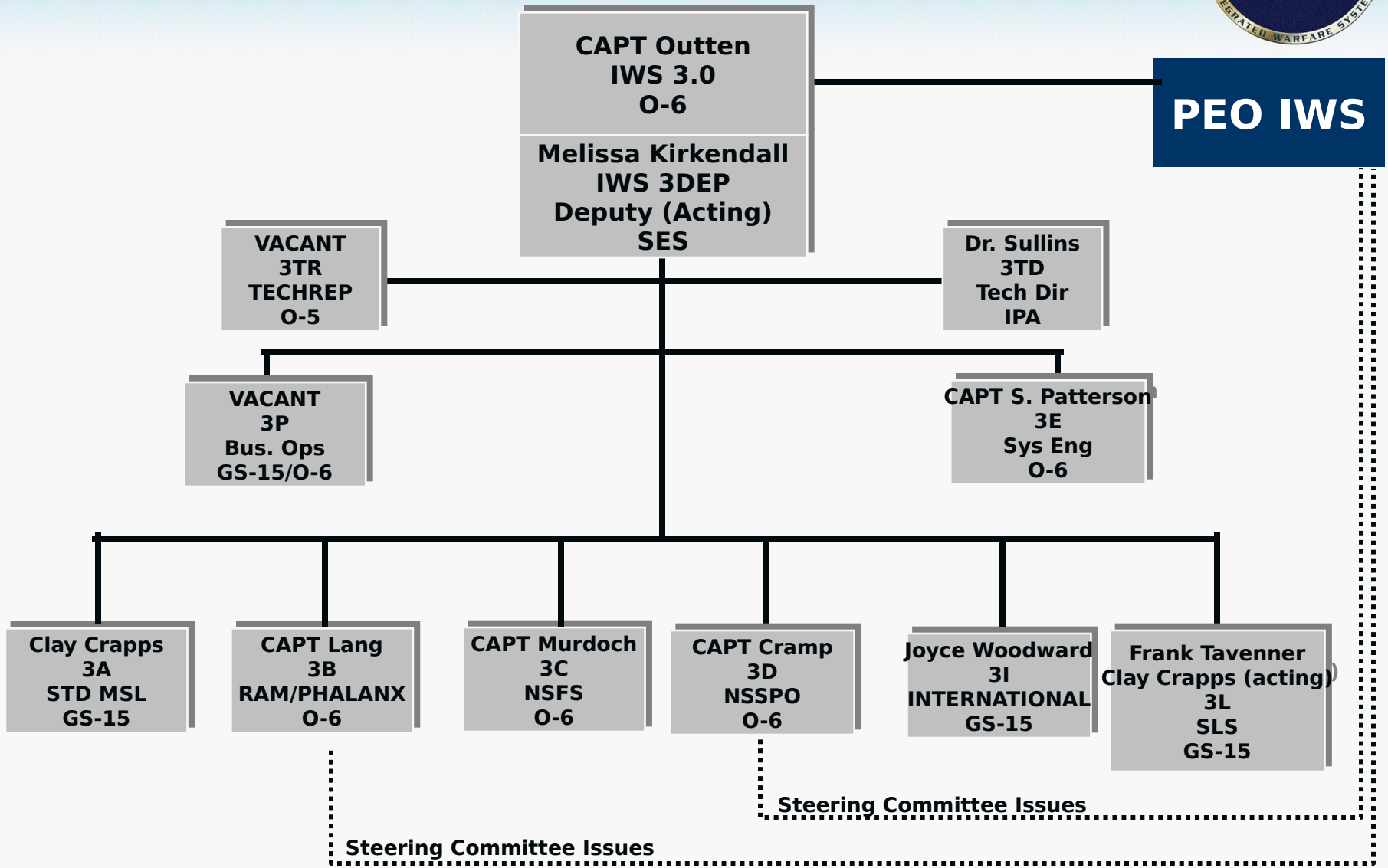
IWS3E Advanced Programs Technology Insertion



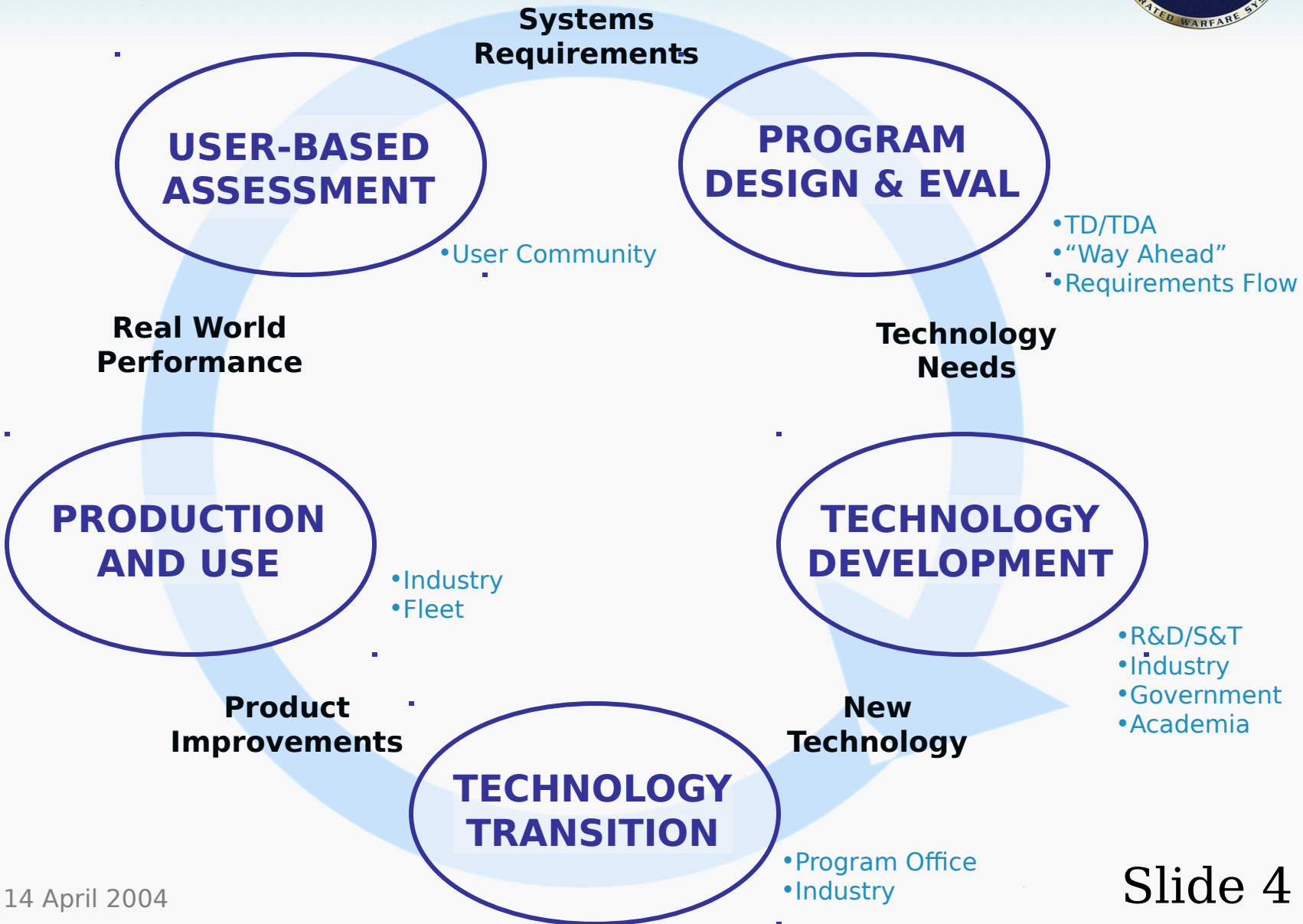
STANDARD MISSILE

- Presentation Agenda
  - Program Office Challenges
  - Technology Insertion Cycle
  - Tech Cycle Products
  - Tech Insertion Activities
  - Tech Insertion Way Ahead
- Technology Areas
  - Sensors & Signal Processing
  - Guidance, Navigation & Control
  - Command, Telemetry & Data Handling
  - Ordnance & Propulsion
  - Airframes and Divert Systems
  - Power Systems
  - Manufacturing/Test Equipment

IWS3E Advanced Programs



IWS3E Advanced Programs Technology Insertion Cycle



IWS3E Advanced Programs
Technology Insertion Products

CYCLE STAGE	PRODUCT	ACTIVITIES
User-Based Assessment	Review & Comment	Continuous
Program Design & Evaluation	Review & Direct Special Analyses	Continuous
Technology Development	Focus Navy-Industry S&T Funding; Coord Joint Developments	SBIR, MANTECH, DACP, FNC, Planning & Coordination
Technology Transition	Develop & Direct Transition Projects	Planning for SBIR Transition
Production & Use	Review & Assess Tech Benefits	Various Usage

IWS3E Advanced Programs
Technology Insertion Activities

- Manufacturing & Production Five Year Plan
- ManTech Issues Input & Coordination
- SBIR Topic Input, Phase I Kick Off, Phase II Review & Support, And Phase III Planning
- OSD Defense Acquisition Challenge Proposal Development And Support
- FNC Project Planning
- Technology Road Map Planning
- PEO IWS “Way Ahead” Planning

IWS3E Advanced Programs
Manufacturing and Producibility

The Development Of A Manufacturing Process To Produce Ceramic Composite Radomes

Raytheon

PROBLEM/ OBJECTIVE

This overall manufacturing process development will end with the capability to provide radomes for production missiles. High surface finished closed graphite dies in vacuum molding can

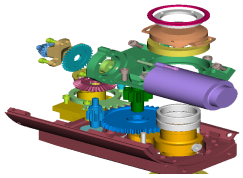
High Performance Common CAS

Raytheon

PROBLEM/ OBJECTIVE

Design a Common Control Actuation System (CAS) for several Air Intercept Missiles (AMRAAM, AIM-9X, ESSM).

ACCOMPLISHMENTS/ PAYOFF



Microstrip Circuit Based IMPATT Transmitter

Raytheon

PROBLEM/ OBJECTIVE

IMPATT diode based Solid State Transmitters (SST) that produce peak powers of over 1 KW have been demonstrated for use in missile seekers. These multi-stage transmitters use Raytheon's combiner plate technology and precision machined cavity circuits to combine the power from several hundred individually packaged IMPATT diodes. A Raytheon IR&D program has developed a diamond substrate microstrip circuit that matches a single IMPATT chip. This planar circuit operates as an oscillator and provides RF performance equal to a cavity circuit.

The objective is to extend this single diode oscillator circuit to multiple diodes and to retune the circuit for amplifier operation. A Proof of Design (POD) transmitter will be constructed using these newly developed microstrip circuits. This POD transmitter will have reduced size, weight and production cost compared to a cavity based transmitter of equal performance.

1 KW IMPATT Transmitter using Cavity Combiner Circuits

Expected Benefits:

Both size and weight of the transmitter will be reduced by approximately a factor of 2.

The SST replaces the traditional TWT/ High Voltage Power Supply transmitter and TWT replacement at the end of its shelf life is eliminated thus providing life cycle cost savings.

Implementation and Technology Transfer:

Navy active seekers program and two-way links

ACCOMPLISHMENTS/ PAYOFF

Anticipated Process Improvement:

This program will extend the single diode microstrip circuit to multiple diodes and to amplifier circuits. Since the microstrip circuits use photolithography rather than machining and mechanical tuning, critical tolerances are much tighter and less assembly labor will be required for each combiner circuit. The microstrip circuit will also be smaller and lighter than a machined cavity. The program will design, fabricate and test a Proof of Design model of a high power IMPATT transmitter. This POD unit will be available for testing in prototype radar systems.

TIMELINE/ MILESTONE

Start Date: October 2002
End Date: March 2004

FUNDING

Navy ManTech: $2.8 M (SST POD unit)

PARTICIPANTS

Raytheon

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- **Radome Manufacturing Process**
- **Common Control Actuation System (CAS)**
- **Microstrip Circuit-Based Impatt Transmitter**
- **Common Processor**
- **Lead-Free Technology for Missile/Military Application**
- **Manufacturable Security Coating**
- **RF MEMS Manufacturing**
- **Moduless Design and Manufacturing**
- **Rapid Prototyping of MMIC's**
- **S/A Devices**

IWS3E Advanced Programs
SBIR Activities

Name	Description	Status
Plasma Drag Reduction for Missiles and Projectiles	Develop and demonstrate a prototype missile/projectile with on-board plasma drag reduction system	Phase II nearing completion, flight test planned
Advanced Tactical Telemetry Transmitter	Implement FM, SOQPSK, and multi-h CPM with FEC in 6 cu. In., >5 Watt unit	Phase II nearing completion. Option planned. Transition to SM-6 BLK I
Nondestructive Inspection of Thermal Batteries	X-ray and automated image analysis. Allows inspection prior to sealing.	Completing Phase I, Transfer to MDA for Phase II
Nondestructive Test for Missile Batteries	Impedance spectroscopy technique allowing in-situ measurement of SOH	Completing Phase I, Phase II approved

IWS3E Advanced Programs
SBIR Activities

Name	Description	Status
Thermal Batteries Fabrication Automation	Assists assembly of 500 pellet batteries for high voltage applications. Will demo at EP through FY05.	Phase I complete, MDA to award Phase II
Development of RBSN Based Materials for Next Generation Tactical Missile Radomes	Fabricate and test of silicone nitride material for high speed radome application	Phase I award approved
Cerablak Matrix CMCs for Next Generation Radomes	Fabricate and test of phosphate matrix CMCs for high speed radome application	Phase I award approved
Fiber Reinforced Ceramic Radome Material with Improved Resistance to Thermal Shock, High Temperature, and Erosion	Fabricate and test of green fiber CMCs for high speed radome application	Phase I award approved

IWS3E Advanced Programs
SBIR Activities

Name	Description	Status
Fiber Reinforced Ceramic Radomes for Next Generation Missiles	Fabricate and test of multiple ceramics and CMCs using gel-casting for high speed radome application	Phase I award approved
Radome Materials & Process for Long Flight Duration-High Speed Missiles	Fabricate and test of silcone matrix/silica fiber for high speed radome application	Phase I award approved
High Speed Multi-Axis Fiber Optic Sensor	Develop a multi-axis fiber optic strain sensor and high speed multiplexing system	Phase I nearing completion, transition to Phase II planned

IWS3E Advanced Programs
DACP Activities

Proposal Name	Description	Funding Requested	Transition
Enhanced Optical System - RAM	Replaces window and other parts of optical assy	DACP Cost = $1.4M Cost Sharing = $4.6M	Transition is immediate to RAM P3I program
Ceramic Gel-casting Process for Tactical Missile Radome Fabrication	Process provide potential alternative to Pyroceram	DACP Cost = $1.8M	Primary Acquisition Sponsor is AMRAAM
CAESAR - Condition And Environmental Sensing And Reporting System	Prototype system capable of optical measurement and storage of VLS environment	DACP Cost = $0.9M	Primary Acquisition Program Is AEGIS BMD (SM-3)
Integrated Missile Harness-Fairing Assembly	Elect. Interconnect assy and fairing are fab'd as integrated unit	DACP COST = $1.63M	Primary Acquisition Program is AMRAAM

IWS3E Advanced Programs

Roadmap - Missile Technology Drivers

Area	Near Term (FY + 5)	Mid Term (FY + 10)	Far Term (FY + 20)
Sensors & Signal Processing Guidance, Navigation & Control Command, Telemetry & Data Handling Ordnance & Propulsion Airframes & Divert Systems Power Systems Manufacturing & Test Equipment	Cost Reliability - Aging Inventories Safety - IM Compliant - IFF Producibility - International Standards - Parts Obsolescence - Increased Complexity Performance - Reduced Target RCS - Advanced Target Countermeasures - Background/Clutter - Maneuvering Targets - Multiple Targets - Improved Lethality - Expanding Target Set - Increased Range & Velocity - Longer Flight Times Interoperability - Joint Operations - Missile Link - DDX/SPY-X - Foreign Sales	Performance - All of Near-Term Plus: - Hypersonic Maneuvering Targets - Increased/Variable Range and Speed (Time to Target, Expanded Mission Areas) - Increased Peak Power Interoperability - All of Near-Term Plus: - Battle Damage Assessment - Open Architecture - FORCEnet/GIG	Performance - All of Near & Mid-Term Plus: - Variable/Adaptive Signature Targets Interoperability - All of Near & Mid-Term Plus: - Changing System Interfaces (Launcher, C4I, OA, etc) - Increased Autonomy and Adaptability (Reduced Warfighter Workload)

Continues Through Mid and Far-Term

IWS3E Advanced Programs

Roadmap - Missile Technology Evolution

Area	Near Term (FY + 5)	Mid Term (FY + 10)	Far Term (FY + 20)
Sensors & Signal Processing Guidance, Navigation & Control Command, Telemetry & Data Handling Ordnance & Propulsion Airframes & Divert Systems Power Systems Manufacturing & Test Equipment	Cost - Automated/Common Design, Manufacturing & Test - Manufacturing Yield Improvements Reliability - Technology Refresh - Design for Obsolescence Safety - MEMS S&A - IM Compliant Motors Producibility - Battery Manufacturing & Test Improvements - Radome Manufacturing - Rapid Prototyping - Built in Test - Titanium Mirror Fabrication Performance - Gimbaled Active/Semi-Active Seeker - Increased RCS Sensitivity - Increased G Airframe/AP - Improved Rear Receiver - Advanced ECM - RAM Uplink - Integrated Guidance & Control - Onboard Multi-Sensor Track Correlation - Enhanced IR Optical System - MEMS Fuze - Thin Celled Thermal Battery	Cost - Automated/Common Design, Manufacturing & Test - Common Distributed Architectures (Power & Data/Processing) - Open Architecture Reliability - Technology Refresh - Design for Obsolescence Safety - IM Compliant Motors Producibility - Lead Free Manufacturing - Anti-tamper Coatings Performance - GPS/INS w/Anti-Jam - Improved ICG&F - Low Cost Ladar Fuze/TDD - Increase RCS Sensitivity - Advanced Radome - Improved ECCM - Very Thin Celled Thermal Battery Interoperability - Tactical Telemetry - Link-16 Type Comm Link - Integrated Fire Control	Cost - Automated/Common Design, Manufacturing & Test - Common Distributed Architectures (Power & Data/Processing) - Open Architecture Reliability - Technology Refresh - Design for Obsolescence Safety - IM Compliant Motors Performance - Improved Algorithms for Adv ECM - Onboard Multi-Sensor Track Correlation and SIAP Data Fusion - Improved Lethality - Jet Reaction Control - Composite Airframe - High Thrust Divert System - Variable Thrust Motor - MEMS Airflow Shaping - Non Rigid Form Factor Energy Storage Interoperability - Advanced Sensor-to-Weapon Link

IWS3E Advanced Programs Technology Insertion Way Ahead

- Goal - Provide Advanced Tech Insertion Reqd to Meet Critical Needs
- Strengthen Foundation
  - Improve Needs and Tech Base Assessment Capability
  - Increase Resources Available For Technology Transition Projects
  - Increase Access To Technology Information
  - Increase Technology Needs Outreach Efforts
- Build On Success
  - Broaden Participation In And Frequency Of Technology Coordination Activities
  - Increase Cross-Program Communication And Project Coordination Capability
  - Get Buy-in Via Joint Technology Investment Reviews
  - Increase Focus On Technology Transition